Explosives Identification:
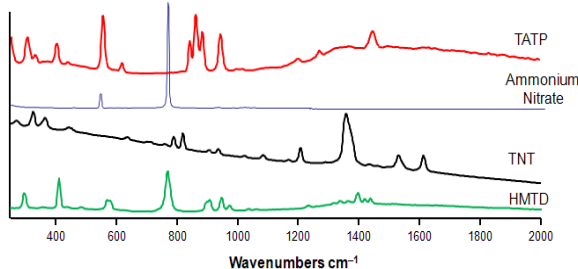## Raman & FTIR Applications

Rapid, precise identification of explosives is one of the key tasks for homeland security and public safety personnel, especially with the marked increase of improvised explosive device (IED) usage worldwide. Portable X-ray devices and trained canines assist first responders in the determining the presence and location of explosives, but are not effective in the identification of unknown explosive materials. Instruments that can be used in the field to rapidly and accurately identify various explosives—and their precursors—are essential tools for bomb technicians responsible for the safety and security of the community.

Ahura Scientific offers a chemical identification toolkit with complementary analytical platforms: FirstDefender, based on Raman spectroscopy, and TruDefender FT, a Fourier Transform Infrared (FTIR) spectroscopy unit. Each instrument and technology offers distinct advantages in specific explosive applications, and when used together extend the capabilities of the bomb technician's toolkit providing more rapid and specific identification results that a responder can rely on.

Raman for Explosives

Raman spectroscopy, the technology in FirstDefender, enables users to safely analyze explosive materials through sealed translucent containers without disturbing the sample. This capability is especially important for bomb technicians who want to avoid contact with a sample wherever possible.

FirstDefender is able to recognize thousands of potential explosives including but not limited to: TATP (triacatone triperoxide), ammonium nitrate, TNT (trinitrotoluene), RDX (cyclonite) and HMTD (hexamethylene triperoxidediamine). Additionally, FirstDefender is capable of identifying explosive precursors in liquid mixtures including: hydrogen peroxide, fuel oil, acetone, and sulfuric acid. FirstDefender collects the molecular fingerprint of an unknown sample, then compares the substance against the on-board chemical library, often providing results in a matter of seconds. FirstDefender excels at identifying liquids, gels, pastes and light colored solid materials.
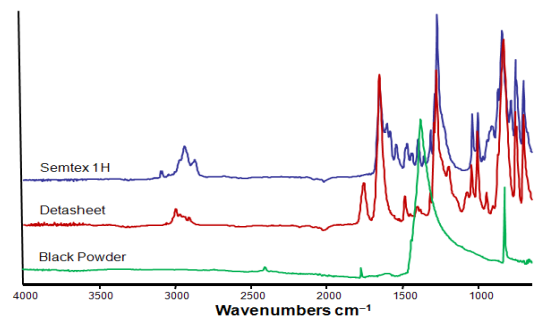
FTIR for Explosives

Certain explosive materials and their precursors have the potential to display fluorescence (generation of light during Raman sampling) which can "disguise" the spectral fingerprint of a material. FTIR is ideal for potentially fluorescent samples because of the way FTIR spectroscopy interacts with an unknown sample—TruDefender FT will not cause a material to exhibit this phenomenon.

TruDefender FT is exceptionally useful for identifying unknown chemicals of a variety of colors. TruDefender FT does not generate energy during the sampling process, which makes it an ideal tool for verifying substances such as: Red Dot, smokeless powders, Pink or Green Detasheet, Semtex, or hundreds of other colored materials. Since contact is required between the sample and the instrument, pressure sensitive materials should be eliminated from the list of suspected substances before deploying TruDefender FT.

Unique Raman spectra of TATP, TNT, ammonium nitrate, and HMTD.

Unique FTIR spectra of Semtax 1H, Detasheet, and black powder.

Explosives Identification:
Raman & FTIR Applications

About FirstDefender

FirstDefender is a lightweight, MIL-STD-810F rugged Raman instrument for rapid (typically within 30 seconds) and accurate non-contact identification of thousands of chemicals, including explosives, narcotics, chemical weapons, toxic industrial chemicals (TICs) and more. Weighing less than four pounds (1.8 kg), FirstDefender is a ground-breaking addition to a first responder's toolbox, and deployed around the world by military, EOD/IED specialists, hazmat teams, and law enforcement organizations.

FirstDefender is equipped with additional safety enhancements to further protect the teams tasked with identifying unknown substances. The recently added Scan Delay feature allows users to delay laser activation for up to 120 seconds, allowing operators to leave the hazard zone during the analysis process if desired. Additionally FirstDefender can be paired with FlexProbe, a semi-rigid fiber optic extension probe which provides users with the ability to fix the sampling tip in place for hard-to-reach locations.

About TruDefender FT

TruDefender FT is a handheld FTIR system designed to identify unknown chemicals directly in the hot zone, enabling faster responses to potentially life threatening scenarios. Built for first responders, TruDefender FT weighs less than three pounds (1.3 kg) and is rugged enough to withstand the rigors of field use.

Using industry proven FTIR technology, TruDefender FT complements FirstDefender to maximize in-the-field coverage of an even broader range of unknown chemicals. Its onboard hazard database includes thousands of unique substances, and provides full safety and treatment information. TruDefender FT is designed for use by first responders, bomb technicians, hazmat teams, homeland security, military and law enforcement personnel.

For More Information

Please contact Ahura Scientific today for more information or to schedule a demonstration.

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